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The danger of microwave ovens in relation to free radicals formation, cellular inflammation, cancer initiation, and cancer progression

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Abstract

The US National Cancer Institute defines cancer as a disease in which some of the body's cells grow uncontrollably and then spread to other parts of the body. Cancer is a major cause of death globally and based on the World Health Organization (WHO) most recent data it accounts for about 10 million deaths annually.

Cancer is a disorder of cell growth and behaviour, so its ultimate cause has to be defined at the cellular and subcellular levels. The focus of this review is on the danger of microwave ovens as a major source of free radicals in food, which then eventually leads to cellular inflammation, cancer initiation, and cancer progression.

Man-made microwave and radiofrequency radiation technologies have been steadily increasing with the growing demand for electronic appliances such as microwave oven. Research have shown that these appliances affect biological systems by increasing free radicals formation, thus leading to oxidative damage.

Cancer is a multistage disease which includes initiation, promotion, and progression. Free radicals in the form of ROS and ORF usually lead to cellular inflammation. Free radicals also lead to DNA damage, gene mutation, and mitochondrial damage. Food prepared or heated in microwave ovens are a major source of free radicals. Hence, the need for people to reduce or totally stop the usage of microwave ovens, especially those already diagnosed with cancer disease. Various research findings support the clinical observations of the author as it relates to the causes and management of cancer disease. The findings also confirm anecdotal evidences on the link between cancer disease and the usage of microwave ovens.

Keywords: Cancer disease; Free radicals; Microwave ovens; Cellular inflammation; Cancer initiation; Cancer progression

1. Introduction

The US National Cancer Institute defines cancer as a disease in which some of the body's cells grow uncontrollably and then spread to other parts of the body [1]. Cancer can start almost anywhere in the human body and usually when normal cells grow old, or become damaged, they die. But, instead of natural death to take place, cancer cells continue to grow [1]. Cancer is a major cause of death globally and based on the World Health Organization (WHO) most recent data it accounts for about 10 million deaths annually [2]. Also from the WHO data, cancer disease is responsible for 1 out of every 4 to 5 deaths worldwide [2].

According to the WHO report, the most common cancers are breast cancer, lung cancer, colon cancer, rectum cancer, and prostate cancer. Also, each year about 400,000 children develop cancer worldwide [2]. From the report of the Global

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Cancer Observatory (GLOBOCAN) and the International Agency for Research on Cancer (IARC), more than 18 million new cases of cancer occur yearly [3]. That number translates to about 1.5 million new cases of the disease monthly. Cancer disease is on the rise globally and based on the GLOBOCAN report, the global cancer burden is expected to increase by about 50% within the next 20 years, that is by year 2040 [3].

Cancer is a disorder of cell growth and behaviour, so its ultimate cause has to be defined at the cellular and subcellular levels. The study of cancer patterns in populations, however, can contribute substantially to knowledge about the origins of cancer. A large number of agents cause cellular damage and induce neoplastic transformation of cells. They include chemical carcinogens, radiant energy, and oncogenic viruses [4]. But the focus of this review is the danger of microwave ovens as a source of free radicals in food, which eventually leads to cellular inflammation, cancer initiation, and cancer progression.

2. Discussion

Man-made microwave and radiofrequency radiation technologies have been steadily increasing with the growing demand for electronic appliances such as microwave ovens. Research have shown that these appliances affect biological systems by increasing free radicals formation, thus leading to oxidative damage [5]. Microwaves are a form of electromagnetic energy, like light waves or radio waves, and it occupy a part of the electromagnetic spectrum of energy. In our modern technological age, microwaves are used to relay long distance telephone signals, television programs, and computer information across the earth, or to a satellite in space. But the microwave is most familiar to us as an energy source for cooking or warming food [6].

The aim of this review is to study the link between food heated in microwave ovens and cancer disease. Meanwhile, studies have shown that over 90% of homes in western countries have microwave ovens which are used for meal preparation [6]. The main reason for this is because microwave ovens are convenient to use and are also energy efficient, especially when compared to conventional ovens. However, there is a need for people to stop using microwave ovens due to the health implications that comes with it. Therefore, this awareness and caution on the health implications of preparing meals with microwave ovens become important notwithstanding what have been officially released from government agencies concerning the safety of microwave ovens [6].

So, the purpose of this review is to present research findings which show that microwave cooking is not natural, nor healthy, and it is far more dangerous to the human body than anyone could imagine. However, microwave oven manufacturers and some government agencies are using politics to suppress these facts and evidences [7]. Because of this, unfortunately, worldwide, people are continuing to microwave their food without knowing the effects and danger of doing so [7].

2.1. Microwave ovens and free radicals generation

Every microwave oven contains a magnetron, which is a tube in which electrons are affected by magnetic and electric fields in such a way that it will produce micro-wavelength radiation. Meanwhile, all wave energy changes polarity from positive to negative with each cycle of the wave. In microwaves, these polarity changes happen millions of times every second and in some cases it happens up to billions of times every second [6]. The microwave radiation generated by microwave ovens interacts with the molecules in the food as it is generated from the magnetron. As the microwave radiation is bombarding the food, it causes the polar molecules to rotate at the same frequency of millions or billions of times a second [6].

All these agitations create molecular friction, which heats up the food. But the friction also causes substantial damage to the molecules in the food, often tearing them apart, or forcefully deforming them. The scientific name for this deformation is structural isomerism [6]. By comparison, microwaves from the sun are based on the principles of direct current (DC), so it does not create frictional heat like the one from microwave ovens which uses alternating current (AC). Radiation causes ionization, which is what occurs when a neutral atom gains or loses electrons. In simpler terms, a microwave oven decays and changes the molecular structure of the food by the process of radiation [6].

Meanwhile, several warnings have been made public relating to the danger of microwave ovens to human health, but they have been barely noticed. An example is the 1989 publication of the Minnesota Extension Service, University of Minnesota, which observed that although microwaves heat food quickly, but it is not recommended for heating baby's bottles. It was observed that the bottle may seem cool to touch, but the liquid inside may become extremely hot and could burn the baby's mouth and throat [6]. In addition, Dr Lita Lee of Hawaii reported in the December 9, 1989 of Lancet that microwaving baby formulas converted certain trans-amino acids into their synthetic cis-isomers. But,

synthetic isomers, whether cis-amino acids or trans-fatty acids, are not biologically active. Also, one of the amino acids, L-proline, was converted to its d-isomer which is known to be neurotoxic and nephrotoxic [6].

In a 1992 comparative study of food prepared conventionally and those prepared in the microwave oven, it was observed that the introduction of molecules and energies which the human body is not accustomed to is very likely to cause harm. The study was carried out by Raum and Zelt. Also, microwaved food contains both molecules and energies that are not present in food cooked in the way humans have been cooking food since the discovery of fire. This is basically because artificially produced microwaves seen in ovens are produced from alternating, and it forces a billion or more polarity reversals per second in every food molecule they hit, thereby producing unnatural molecules in the process [6].

In a similar study, Dr Hertel noted that leukocytosis which cannot be accounted for by normal daily deviations is taken very seriously by heamatologists. That is because leukocytes are often signs of pathogenic effects on the living system, such as poisoning and cell damage. Therefore, a more pronounced increase of leukocytes observed during the study by Dr Herterl, after the ingestion of microwaved foods, was considered serious pathological finding which has significant health implication [7]. But that did not come as a surprise considering that atoms, molecules, and cells hit by this hard electromagnetic radiation are forced to reverse polarity about 1 billion to 100 billion times a second. And there are no atoms, molecules, or cells of any organic system that will be able to withstand such a violent destructive power, for an extended period of time [7].

From historical records, the Nazis originally developed the microwave ovens for use in their mobile support operations during the invasion of Russia in World War 2. With that, they were able to eliminate the logistical problems of using cooking fuels, as well as the convenience of producing edible products in a greatly reduced time. That is, by being able to utilize electronic equipment for preparation of meals on a mass scale. But, after the war the Allies discovered medical research done by the Germans on microwave ovens. And the research documents, along with some working model of microwave ovens, were transferred to the United States War Department for further scientific investigation. The Russians also retrieved some microwave ovens and carried out thorough research on their biological effects. Based on the findings of the Russian scientists, the use of microwave ovens was outlawed in the Soviet Union in 1976. But later it was lifted during Perestroika [6].

So, twenty years of Russian research, and German studies, as far back as 1942, made a strong argument against the safety of using microwave ovens for cooking. Infact, the Soviets issued an international warning on the health hazards (both biological and environmental) of microwave ovens, and similar electronic devices [7]. Other Eastern European scientists also reported the harmful effects of microwave radiation and thereafter set up strict environmental limits for their usage [7]. Moreover, the outcome of the Russian investigations which was published by the Atlantis Raising Educational Center in Portland, Oregon, reported that carcinogens were formed in virtually all the microwaved foods that were tested. Also, free radicals were formed in microwaved vegetable plants, especially root vegetables [6].

2.2. The role of free radicals in cellular inflammation

It is a well known fact that the chemical species derived from oxygen are cytotoxic, and they are also involved in the aetiology of cancer disease [8]. Several carcinogens exert their effect by producing reactive oxygen species (ROS) and that usually lead to an oxidative damage of cellular DNAs. That also plays a major role in the process of carcinogenesis, especially in the initiation and progression stage. In addition, oxidative damage has been identified as being responsible for the mitochondrial changes in cancer cells. Meanwhile, mitochondrial dysfunction usually leads to a low coupling efficiency of the mitochondrial electron transport chain (mETC), thereby raising electron leakage and increased ROS formation [8].

In aerobic life, oxidative stress usually arises from both endogenous and exogenous sources. Despite antioxidant defense mechanisms, cell damage from oxygen free radicals (OFR) is very common. So, OFR related lesions that do not cause cell death can stimulate the development of cancer disease. In addition, a large body of evidence suggests the destructive roles of OFR in the expansion of tumour clones and the acquisition of malignant properties by cells. For this reason, OFR may be classified as an important class of carcinogens. Therefore, reducing avoidable endogenous and exogenous causes of oxidative stress is very vital [9].

In another study, the negative function of free radicals was observed to cause various harmful effects in cell components, such as lipid peroxidation, protein structure alteration, DNA mutation, mitochondrial damage, and structural modification of nucleic acid [10]. Also, the role of free radicals as it relates to different cancer stages was observed, starting with initiation, progression, proliferation, invasion, and angiogenesis. Various stages of cancer disease have

proved that ROS contributed significantly to cancer development especially as seen in colon cancer development from colitis, after inflammatory infiltration. Same has also been observed in oesophagitis and pancreatic cancer, which are both induced by tobacco and alcohol. The study therefore concluded that free radicals inflammation indeed have a role in all the stages of cancer formation and progression [10].

2.3. The pathological link between cellular inflammation, cancer initiation, and cancer progression

In 1863, a German pathologist by the name of Rudolf Virchow observed the presence of white blood cells in cancerous tissues. Meanwhile, white blood cells are part of the body's inflammatory response, which is activated to fight invaders such as pathogens and also to heal damaged tissues. Based on his observation, the German pathologist proposed a new idea about the origins of cancer disease, and he suggested that some cancer may start at sites of chronic inflammation. That is, in places where inflammation persists after it is no longer needed [11]. That basic idea has stood the test of time, and over the years research has confirmed that chronic inflammation in certain parts of the body, such as the cervix or the colon, can increase the risk of cancer in those organs. But Virchow's observation marks just the beginning of a story about cancer and inflammation that is still being written today. Right now, inflammation is considered a hallmark of cancer disease [11].

Lung cancer is the most common and fatal malignant tumor in the world [12]. Meanwhile, tumor micro environment (TME) is closely related to the occurrence and development of lung cancer. So, inflammatory microenvironment plays an important role in cancer disease. Specifically, inflammatory cells and inflammatory factors in the tumor inflammatory micro environment promote the activation of the NF-κB and STAT3 inflammatory pathways [12]. It also leads to the occurrence, development, and metastasis of lung cancer. By promoting immune escape, tumor angiogenesis, epithelial–mesenchymal transition, apoptosis, and other mechanisms. Clinical and epidemiological studies have also shown a strong relationship among chronic infection, inflammation, inflammatory micro environment and cancer [13]. In addition, various research on the mechanisms of pro-tumorigenic inflammatory pathways have confirmed inflammation to be instrumental to the development of different stages of tumor. That includes tumor initiation, metastatic spread, and metastatic outgrowth [14].

3. Conclusion and Suggestions

Cancer is a multistage disease which includes initiation, promotion, and progression. Free radicals in the form of ROS and ORF usually lead to cellular inflammation. Free radicals also lead to DNA damage, gene mutation, and mitochondrial damage. All these pathological sequences then result in the initiation, promotion, and (or) progression of cancer disease. Meanwhile, food prepared or heated in microwave ovens are a major source of free radicals in the human body. Hence, the need for people to reduce or totally stop the usage of microwave ovens, especially those that have already been diagnosed with cancer disease.

The above research findings support the clinical observations of the author as it relates to the causes and management of cancer disease. The research findings also support multiple anecdotal evidence on the link between cancer disease and the usage of microwave ovens. In conclusion, inflammation predisposes to the development of cancer disease, and it also promotes the various stages of tumorigenesis. Therefore, agents or factors that can lead to inflammation should be avoided as much as possible and that includes the consumption of food prepared using microwave ovens.

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